Measurement of azimuthal anisotropy parameters v_2 of multi-strange baryons in $^{197}Au + ^{197}Au$ collisions at $\sqrt{s_{NN}} = 200$ GeV

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The elliptic component of the event-wise anisotropy of particle emission holds much promise for studying the early stages of ultrarelativistic nuclear collisions [1–3]. From studies of transverse radial flow, it was suggested in [4] that mutli-strange baryons might interact less in a hadron gas. Thus, measurements of multi-starnge baryons give direct access to the early stages possibly with partons – quarks and gluons – as the relevant degrees of freedom.

Strange and multi-strange particles were reconstructed using the topology of their decay, $\Lambda \rightarrow p + \pi^-$ and $\Xi^- \rightarrow \Lambda + \pi^-$ and the corresponding decay of their anti-particles. Tracks of daughter candidates were reconstructed in the STAR Time Projection Chamber. The momentum of the daughter candidates and the geometry of the decay were used to reconstruct the invariant mass of Λ and Ξ candidates. Raw yields were extracted from the enhancement in the invariant mass distribution around the particle mass. The azimuthal anisotropy parameter v_2 were then obtained from the azimuthal distribution of these raw yields with respect to the event plane. Figure 1 shows the measured azimuthal anisotropy parameters v_2 as a function of transverse momentum p_T for $\Lambda + \overline{\Lambda}$ (open triangles) and $\Xi^- + \overline{\Xi}^+$ (solid circles). The results are from minimum bias $^{197}Au + ^{197}Au$ collisions at $\sqrt{s_{NN}} = 200$ GeV and the rapidity range $|y| < 1.0$. The v_2 parameters increase with transverse momentum and seem to saturate at $p_T > 3$ GeV/c. Within the statistical error in the measurement of $\Xi^- + \overline{\Xi}^+$, we find agreement with results from $\Lambda + \overline{\Lambda}$. The lines show results from calculations within a hydrodynamical framework [5] for π (dashed), K (dotted), p (dash-dotted) and Λ (solid). The calculations describe v_2 of Λ reasonably well at $p_T < 2.0$ GeV/c. However, the calculations predict a monotone increase of v_2 and therefore fail to describe the observed saturation at $p_T > 3$ GeV/c. It would be interesting to study the particle(mass) dependence of this saturation. Here, the triple-strange $\Omega^- \rightarrow \Lambda + K^-$ is of special importance.

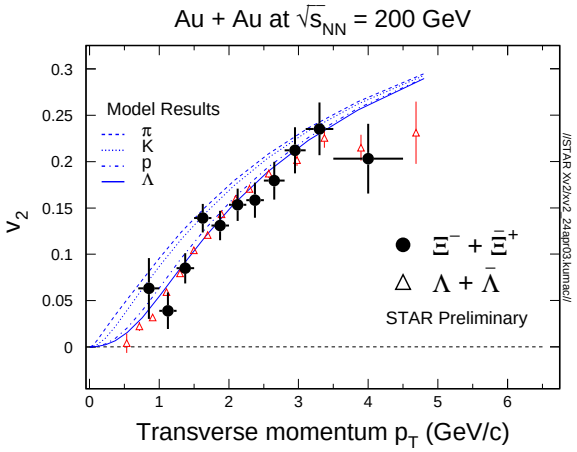

FIG. 1: Azimuthal anisotropy parameters v_2 as a function of transverse momentum p_T for $\Lambda + \overline{\Lambda}$ (open triangles) and $\Xi^- + \overline{\Xi}^+$ (solid circles). The results are from minimum bias $^{197}Au + ^{197}Au$ collisions at $\sqrt{s_{NN}} = 200$ GeV and the rapidity range $|y| < 1.0$.

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